

What is claimed is:

CLAIMS

102  
Hathaway  
Chida (fig 10)  
Itsumi (fig 3/4)  
M.C.I.  
fig 22-25  
An actuator device comprising:

at least a first and a second electro-active element; and

at least a first and a second conductor,

wherein said first conductor is in direct electrical contact with said first electro-active element, and said second conductor is in direct electrical contact with said second electro-active element; and

wherein said first and second electro-active elements and said conductors are arranged such that said device forms a generally sigmoidal shape upon activation of said first and second electro-active elements.

- ① 2. The actuator device of claim 1, further comprising at least a third conductor, and wherein said first electro-active element comprises at least a first and a second region, and

wherein said first conductor is in direct electrical contact with said first region of said first electro-active element, and said third conductor is in direct electrical contact with said second region of said first electro-active element.

- ① 3. The actuator device of claim 1, further comprising an inactive element.

- ① 4. The actuator device of claim 2, wherein at least two of said at least three conductors are in electrical communication with each other.

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5. The actuator device of claim 2, wherein said inactive element is a component of a disk drive.
- ① 6. The actuator device of claim 1, wherein at least one of said electro-active elements is driven in a positive orientation relative its poling field, and at least one of said electro-active elements is driven in a negative orientation relative to its poling field.
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7. The actuator device of claim 1, said device further comprising an enclosing layer encasing said electro-active elements and said conductors, and wherein said actuator device forms a card.
- ① 8. The actuator device of claim 1, wherein said at least first and second conductors are in direct electrical contact with said at least first and second electro-active elements at a plurality of points.
- ① 9. The actuator device of claim 1, wherein said actuator device is shear-coupled to an object.
- ① 10. The actuator device of claim 1, wherein said actuator device is configured as a stack, a flexure, a shell, a plate, or a bender.
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Crawley
11. The actuator device of claim 1, further comprising an insulator, and wherein said first and second electro-active elements and said insulator are bonded together such that in-plane strain in said first and second electro active elements is shear coupled between said first and second electro-active elements and said insulator.
- ① 12. The actuator device of claim 11, further comprising at least a third conductor, and wherein said third conductor is in direct electrical contact with said first or second conductor.

- ① 13. An actuator device comprising:
- at least one electro-active element having at least a first region and a second region; and
- at least a first and a second conductor,
- wherein said first conductor is in direct electrical contact with said first region of said electro-active element, and said second conductor is in direct electrical contact with said second region of said electro-active element; and
- wherein said electro-active element and said conductors are arranged such that said device forms a generally sigmoidal shape upon activation of said first and second regions of said electro-active element.
- ① 14. The actuator device of claim 13, wherein said first and second regions of said electro-active element are poled in opposite directions.
- ① 15. The actuator device of claim 13, wherein said first and second regions of said electro-active element are poled in the same direction.
- ?? 16. The actuator device of claim 13, wherein said actuator device is shear-coupled to an object.
- ① 17. The actuator device of claim 13, wherein said actuator device is configured as a stack, a flexure, a shell, a plate, or a bender.
- ① 18. The actuator device of claim 13, further comprising an insulator, and wherein said electro active element and said insulator are bonded together such that in-plane strain in said electro-active element is shear coupled between said electro-active element and said insulator.

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19. The actuator device of claim 18, further comprising at least a third conductor, and wherein said third conductor is in direct electrical contact with said first or second conductor.

20. A method for damping vibration of an object, said method comprising the steps of:

(a) bonding the actuator device of claim 1 to the object such that in-plane strain of said at least first and second electro-active elements mechanically acts on the object when an electrical signal is applied to at least one of said at least first and second conductors; and

(b) applying an electrical signal to said one of said conductors.

21. A method for forming an actuator device, said method comprising the steps of:

(a) preparing a flex circuit comprising an insulator and at least a first and a second conductor; and

(b) bonding an electro-active element to said flex circuit such that in-plane strain in said electro-active element is shear coupled between said electro-active element and said flex circuit, and such that said electro-active element is in direct electrical contact with said at least first and second conductors.

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